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Aquifer Analyses and Proposed Pump Test Specifications
Standard Chlorine RI/FS

January 1990

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Introduction

In accordance with the conditions specified in the RI/FS Work Plan, this document has been prepared to present the results of the calculations that use the upper Potomac aquifer characteristics to predict the anticipated aquifer responses from pumping Star Enterprise well OR-6A. Additionally this document outlines the proposed specifications of the pump test, and provides the basic assumptions upon which the test was designed. Data generated from the pump test will be used to determine aquifer and confining unit characteristics in the site vicinity, and to evaluate the potential impact of ground water contamination at the Standard Chlorine site on the upper Potomac aquifer.

OR6A or OR6B OR

Aquifer Analyses

As specified in the RI/FS Work Plan, a pump test will be conducted on the Star Enterprise well OR-6A which is screened from 102 to 176 feet below ground surface within the upper Potomac aquifer. On 19 March 1985 NUS Corporation (NUS) conducted a pump test on OR-6A for a duration of 5.1 days at a rate of 402 gpm. Using pump test data generated at observation well OR-6B (a well screened in the upper Potomac aquifer and approximately 100 feet from the pumping well), a transmissivity of 16,180 gpd/ft and a storativity of 1.2×10^{-4} were calculated by NUS for the upper Potomac aquifer. The vertical hydraulic conductivity of the overlying confining bed was determined to be 8.96×10^{-4} cm/sec. Aquifer characteristics generated from the NUS pump test were used to predict aquifer responses during the RI pump test at the SCD facility.

Since the NUS data indicates that the upper Potomac aquifer is a semi-confined system, equations derived for semi-confined aquifers (Walton, 1962) were used to predict aquifer drawdowns from pumping OR-6A. Given the NUS-generated aquifer characteristics and a confining unit thickness of 50 feet, the drawdown at a given distance from the pumping well was determined using Walton's model given a constant discharge rate and a pumping duration. Several calculations were made to determine the optimum pumping rate and duration for the RI pump test. The step drawdown and pump test data obtained during the NUS study indicates that the optimum discharge rate for pump testing OR-6A is on the order of 400 gpm. The calculations presented in Table 1 show that using a pumping

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Is this correct?

rate of 400 gpm for a duration of four days will cause sufficient drawdown in the wells monitoring the upper Potomac aquifer. Table 1 presents predicted drawdowns at varying distances from OR-6A using this pump test scenario. A range of leakance values that were calculated using the low and high confining unit vertical permeabilities given in the NUS report were also modeled to show the possible range of drawdowns. As shown in Table 1, with either of the confining unit permeability values, the 400 gpm constant discharge rate and 4 day test duration will provide sufficient response/stress on the upper Potomac aquifer to determine the hydraulic characteristics of the aquifer and the confining unit, and to identify potential discontinuties in the confining unit at the Standard Chlorine site.

Is this correct?

Proposed Test Specifications

Based on the results of the aquifer analyses contained herein, it is proposed that the pump test at well OR-6A be conducted for a duration of four days using a constant pumping rate of 400 gpm. Following installation of the temporary pump in OR-6A, a short term (i.e., 2-4 hour) step drawdown test will be conducted on OR-6A to verify the present ability of the well to sustain a yield of 400 gpm over a four day period.

For the pump test, water levels will be continuously monitored at the pumping well, and in several upper Potomac and Columbia monitor wells. The upper Potomac observation wells will include OR-6B and monitor wells MW-11 and MW-12 to be installed during the RI. It should be noted that Occidental's upper Potomac wells A17 and A21 have been abandoned and will not be available for monitoring as proposed in the Work Plan. Continuous water level monitoring will also be conducted at the following Standard Chlorine Columbia monitor wells: existing wells TW-1, TW-4, TW-24, TW-25, TW-30, TW-49, and RI wells MW-5, MW-6, MW-7 and MW-9. In addition, periodic water level measurements will be obtained from the remaining Standard Chlorine Columbia monitor and recovery wells. In addition, the four staff gauges, two in Red Lion Creek and two in the unnamed tributary, will be monitored for water elevation fluctuations.

Monitoring of water levels will begin at least 48 hours prior to pumping to determine background water level fluctuations/trends. A recording barometer will be stationed on site to measure changes in barometric pressure. Tidal fluctuations measured at the nearest recording station will be obtained to determine their effects upon water levels.

Following the 48-hour monitoring period, the pump in OR-6A will be started and set at a rate of 400 gpm. The pumping

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rate will be measured using an in-line flow meter or an orifice pipe. Pumping will continue for a period of four days. Discharge water from OR-6A will be routed to Red Lion Creek through a temporary discharge line. At the conclusion of the pumping phase of the test, rates of water level recovery will be measured for a period of at least 48 hours.

Should we analyze samples from OR-6B before allowing upper Potomac water to run into Red lion Creek?

TABLE 1
PREDICTED DRAWDOWN WITHIN UPPER POTOMAC AQUIFER
STANDARD CHLORINE RI/FS
JANUARY 1990

GIVEN:

Aquifer transmissivity= 16180 gpd/ft
Aquifer storativity= 0.0012
Confining unit thickness= 50 feet

DISTANCE FROM OR-6A (ft)	TIME (days)	PUMP RATE (gpm)	LEAKANCE VALUE (r/B)	W(u,r/B)	u	CONFINING UNIT VERTICAL HYDRAULIC CONDUCTIVITY (cm/sec)	PREDICTED DRAWDOWN (ft)*
100 (OR-6B)	4	400	0.00485	7.3750	0.000346	8.96E-08	20.9
500	4	400	0.02420	4.1550	0.008668	8.96E-08	11.8
1000	4	400	0.04850	2.8130	0.034672	8.96E-08	8.0
2200 (MW-11)	4	400	0.10700	1.3643	0.167814	8.96E-08	3.9
2400 (MW-12)	4	400	0.11600	1.2196	0.199713	8.96E-08	3.5
100 (OR-6B)	4	400	0.02510	6.9850	0.000346	2.41E-06	19.8
500	4	400	0.12600	3.7834	0.008668	2.41E-06	10.7
1000	4	400	0.25100	2.4464	0.034672	2.41E-06	6.9
2200 (MW-11)	4	400	0.55300	1.2105	0.167814	2.41E-06	3.4
2400 (MW-12)	4	400	0.60300	1.0751	0.199713	2.41E-06	3.0

* After Walton, 1962.